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XXXI.—*Note on the Sexual Characters of Ligia oceanica.* By CHARLES CHILTON, M.A., D.Sc., M.B., C.M., F.L.S., Research Fellow, Edinburgh University.

[Plate VIII.]

WHILE investigating some Australasian species of *Ligia* recently I found that in two of the species there were well-marked differences between the male and the female in the character of the anterior appendages of the peræon. It is probable that such differences are fairly common in the Ligiidæ, though in consequence of the general uniformity of the peræonal appendages in this family, and of the fact that they are largely concealed beneath the body and have not been hitherto much used in specific descriptions, these differences are not very prominent and may be readily overlooked. For the purpose of comparison I examined specimens of *Ligia oceanica*, and found that there are similar differences in this species also, both in the anterior peræopoda and, to a less degree, in the antennæ; and as I cannot find that anyone has drawn special attention to these sexual differences in this species, I now briefly describe them.

Bate and Westwood say:—"The male is much larger than  
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the female, and is generally of a paler and less varied colour"\*. Budde-Lund gives the dimensions as "Long. 20-28 mm.; lat., ♂ 8-10 mm., ♀ 10-14 mm.; alt. 3.5-5 mm." †; but, so far as I can ascertain, gives no difference beyond this one in width, while Sars, on the other hand, speaks only of a difference in length, saying, "Length of adult female 20 mm., of male up to 28 mm." ‡ Dollfus, in his paper on the distribution of the genus *Ligia*, says:—"Les femelles, plus petites, sont généralement plus nombreuses que les mâles" §.

If we turn to other species of *Ligia*, our recorded knowledge of the differences between the male and female does not seem to be much more complete. Budde-Lund gives very brief descriptions of the first pair of legs in the male in *Ligia occidentalis*, *L. cinerascens*, *L. exotica*, *L. Olfersii*, and *L. dentipes*, but does not state in what respect these appendages differ from those of the female; in the case of *L. exotica* he mentions also that in the male the uropods are three fourths the length of the body, but in the female scarcely two thirds ||. Dollfus has also drawn attention to the differences between the sexes in *L. exotica* as regards the first pair of legs, and has figured the extremities of these legs in the typical form and also in specimens from Bermuda, for which he has established the variety *hirtitarsis* ¶.

In the nearly allied family of the Trichoniscidæ we find that sexual differences have been described in *Trichoniscus roseus* by Max Weber\*\* and Sars †† among others, though, in keeping with that fickleness which so often characterizes these differences, here it is the seventh pair of legs, and not the first, that is specially modified in the male.

Dollfus has described and figured a remarkable enlargement of the extremity of the first, third, and fourth legs in *Philoscia anomala*, and has given references to similar modification in other species of *Philoscia*. In the case of *P. anomala*, since the enlargement was found in some of the males only, he thinks that it is perhaps a temporary character fully

\* 'British Sessile-eyed Crustacea,' ii. p. 446.

† 'Crustacea Isopoda Terrestria,' p. 260.

‡ 'Crustacea of Norway,' II. Isopoda, p. 156.

§ 'Feuille des jeunes Naturalistes,' sér. iii. no. 278.

|| 'Crustacea Isopoda Terrestria,' pp. 264-268.

¶ "Isopodes terrestres du 'Challenger,'" Société d'Etudes scientifiques de Paris, xii.° année, p. 8.

\*\* "Anatomisches über Trichonisciden," Archiv für mikroskop. Anat. Bd. xix. p. 624 &c.

†† 'Crustacea of Norway,' II. Isopoda, p. 163.

developed only at the pairing-season\*. Later on he described a similar modification in the first pair of legs in the male of *Philoscia variegata* from Venezuela †.

Probably similar differences will be found to exist in many other species of Terrestrial Isopoda, and may have been recorded; but the above references, for some of which I have to thank the Rev. T. R. R. Stebbing and Monsieur Adrien Dollfus, are all that I have so far been able to find on the subject.

In *Ligia oceanica* the male when fully adult is, as has been already stated by other authors, usually larger than the female; but though the female, when its brood-pouch is fully distended with eggs or young, may be wider in proportion than the male, this does not seem to be always so, for in the case of the specimens specially examined and drawn for this paper the male was 25 millim. long and 12 millim. wide, while the female was 24 millim. long but only 10 millim. broad, though the brood-pouch was well filled with eggs.

The outer antennæ show some slight differences in the two sexes, being appreciably stouter in the male both in the peduncle and in the flagellum. This will be seen on comparison of figs. 1 *ant* and 2 *ant* (Pl. VIII.), which are taken from male and females of nearly the same size, and are magnified to approximately the same amount. In the female the antennæ are sometimes slightly more spiny than in the male, but I have not been able to make out any constant differences in the proportions of the various joints. I was in the museum of the Dundee University College when the greater stoutness of the antennæ of the male was first noticed, and Mr. Calman and I then went over a large number of specimens in the collections of the museum, and found that in fully adult specimens we could correctly separate the males and females by the characters of the antennæ alone; in smaller and immature specimens the differences are naturally not so marked.

When we turn to the appendages of the peræon we find that there are slight modifications in the male in the first, second, and third pairs. As these three pairs differ from one another only in the fact that each is very slightly longer than the preceding, I have drawn only the second pair (fig. 1 *pp*<sup>2</sup>).

\* *L. c.* p. 5.

† Extrait des 'Annales de la Société Entomologique de France,' vol. lxii. p. 343.

On comparison of this with fig. 2  $prp^2$ , which represents the same appendage in the female, it will be seen that in the male the meros, carpus, and propodos are all produced on the inner side into a flat plate-like expansion, with the free border more or less convex and fringed with short setæ; on the anterior surface this expansion is on a level with the rest of the joint, but on the posterior aspect (shown in fig. 1  $prp^2$ ) the cylindrical portion of each joint can be seen and the plate-like character of the expansion thus rendered more evident. On examination with a high power each expansion shows on its surface rows of small serrations, giving it an appearance like that of a file; and further magnification shows that this is due to closely-set rows of minute setæ. In the female there is no trace of these expansions, and the inner border of the different joints, more especially of the meros and carpus, bear numerous stiff setæ, which are larger and more irregular in size than those found in the corresponding positions in the male.

In order to make this short paper on the sexual characters of *Ligia oceanica* somewhat more complete, I have given figures of the first and second pleopoda of the male. These have been already drawn and briefly described by Sars\*, and as their form can be readily made out from the figures, a detailed description is not here necessary. In the second pleopod (Pl. VIII. fig. 1  $plp^2$ ) the whole of the endopodite appears to be modified into a two-jointed styliform organ, moved by powerful muscles; its second joint is long and cylindrical, and along with the external male organ proper (which is figured in connexion with the first pleopod in fig. 1  $plp^1$ ) no doubt forms a channel for the passage of the spermatozoa; its extremity is roughened on the inner side from the presence of numerous closely-set short setæ.

In both pleopods is seen a more or less oval plate, external to the exopodite and arising apparently from the outer part of the basal portion of the pleopod; in the case of the second pleopod its margin is fringed with fine setæ. This plate has been figured by Sars in this and in other species of the Oniscoidea, but I cannot find any special reference to it, and I am not quite certain as to its exact homology and significance; it appears, however, to correspond with a similar plate found on the third, fourth, and fifth pleopoda in the species of

\* 'Crustacea of Norway,' II. Isopoda, p. 155, pl. lxx. figs.  $plp^1$  ♂ and  $plp^2$  ♂.

*Phreatoicus* which I have elsewhere suggested may be looked upon as an "epipodite" \*.

This paper was commenced in the zoological laboratory of University College, Dundee; and I have to record my best thanks to Professor d'Arcy W. Thompson, C.B., for kind permission to make free use of his collections, and to Mr. W. T. Calman for assistance in this and other matters.

## EXPLANATION OF PLATE VIII.

- Fig. 1 ant.* Outer antenna of a male specimen of *Ligia oceanica*, 25 mm. long and 12 mm. broad.  $\times 6$ .  
*Fig. 1 prp*<sup>2</sup>. Second pereopod of the same specimen.  $\times 9$ .  
*Fig. 2 ant.* Outer antenna of a female specimen, 24 mm. long, 10 mm. broad (brood-pouch full of eggs).  $\times 6$ .  
*Fig. 2 prp*<sup>2</sup>. Second pereopod of the same specimen.  $\times 9$ .  
*Fig. 1 plp*<sup>1</sup>. First pleopod of male, posterior aspect.  $\times 19$ .  
*Fig. 1 plp*<sup>2</sup>. Second pleopod of male, posterior aspect.  $\times 19$ .

XXXII.—*A Revision of the Pierine Genus Huphina, with Notes on the Seasonal Phases and Descriptions of new Species.* By ARTHUR G. BUTLER, Ph.D., F.L.S., F.Z.S., &c.

THE present genus is one of the most pleasing in the sub-family Pierinae. It is related to *Ganoris* and *Pinacopteryx*, but some of the species show apparent affinity to *Catophaga* (from which, however, the absence of the anal tuft in the males would readily serve to distinguish this sex). It separates into two well-defined groups, the first of which commences with forms resembling *Catophaga* and having well-defined seasonal phases, but terminates with forms more nearly resembling *Delias* in which seasonal phases are possibly non-existent. The second group in its colouring reminds one of *Delias*, *Catopsilia*, and *Ganoris*, but concludes with species having an under-surface colouring peculiar to this genus alone. The seasonal phases when known are less pronounced in their distinctive characters than in the earlier forms of the first group, and vary somewhat in the subgroups having the coloration of the genera above noted; those which remind one of *Delias* seem to have no defined seasonal phases.

\* See Trans. Linn. Soc., Zool. ser. 2, vol. vi. part 2, pp. 195 & 203; and 'Records of the Australian Museum,' vol. i. p. 164.